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In a connection direction referred to as the "downlink" DL from the base station to the mobile station, each of the carrier frequencies f1 to f12 has seven timeslots TS1 to TS7 as transmission resources, while in a connection direction referred to as the "uplink" UL from the mobile station to the base station each of the carrier frequencies f1 to f12 has five timeslots TS1 to TS5 as transmission resources. Free, unused timeslots are assigned by way of example to the carrier frequencies f2, f7, and f11 and designated by the letter "F".

FIG 4 is an overview showing a synchronization situation of the radio cells FZ1 to FZ3 depicted in FIG 3 that corresponds to the prior art.

The individual base stations BTS01 to BTS03 are neither frequency- nor time-synchronized with one another. A base-station-specific carrier frequency deviation Delta01 to Delta03 is plotted vertically in each case for each one of the base stations BTS01 to BTS03. Said carrier frequency deviation Delta01 to Delta03 is due in each of the individual base stations BTS01 to BTS03 to electrical components of the respective base station, for example to base-station-specific local oscillators. As the mobile stations T01 to T012 are synchronized to the respective assignable base station BTS01 to BTS03, the base stations BTS01 to BTS03 and the correspondingly assigned mobile stations T01 to T012 also have the respective carrier frequency deviations Delta01 to Delta03 with respect to one another.

Synchronization of a "slave base station" with a "reference base station" is known from US 5,872,774. In this solution the "slave base station" receives messages of the "reference base station" via a mobile station which is located in what is

referred to as a "soft handoff region" between the reference base station and the slave base station. The "slave base station" is synchronized using "round trip delay" measurements.

A synchronization method is known from WO 00/35117 A2 wherein time differences between adjacent base stations are measured directly at a base station under consideration. Relative time errors are determined and eliminated on the basis of already known position coordinates of the base stations. In the event that no direct measurement of base station signals of the adjacent base stations is possible at the base station under consideration, a "fixed mobile" which is located in what is referred to as a "soft handoff region" is used for forwarding said base station signals.

It is the object of the present invention to implement a cellular radio communication system, in particular an OFDM radio transmission system, in such a way that, taking into account minimal co-channel interference, subscribers are

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Claims

1. A method for synchronizing a radio communication system divided up into radio cells,
   - wherein data is transmitted by means of timeslot multiple access methods and wherein each radio cell has a base station for providing radio coverage to a plurality of mobile stations assigned to the radio cell,
   - wherein, in addition to mobile station signals of its own radio cell, a base station also receives mobile station signals from adjacent radio cells,
   - wherein the base station determines a number of mobile stations on the basis of the mobile station signals and compares said number with at least one predefined threshold value,
   - wherein, if the number falls below at least one threshold value, a first synchronization method for synchronizing the base station and the assigned mobile stations is used, said first synchronization method corresponding to an assigned transmission standard of the radio communication system,
   - if the number exceeds at least one threshold value, a second synchronization method is used in which a base station evaluates the received mobile station signals to determine a time synchronization value and a frequency synchronization value to which the base station synchronizes itself,

   characterized in that

   - wherein, if the at least one threshold value is exceeded, as well as base station signals of its own radio cell, a mobile station also receives base station signals from adjacent radio cells, and

- the mobile station evaluates the received base station signals to determine a time synchronization value and a frequency synchronization value to which the mobile station synchronizes itself.

2. The method as claimed in claim 1, characterized in that base stations of adjacent radio cells use radio transmission resources from a stock that is collectively assigned to the base stations for data transmission purposes.

3. The method as claimed in claim 1 or 2, characterized in that with the second synchronization method the base stations use timeslots of collectively assigned carrier frequencies as radio transmissions resources.

4. The method as claimed in one of the preceding claims, characterized in that with the second synchronization method at least two adjacent base stations (BTS1, BTS3) simultaneously and jointly employ a timeslot (TS5) of a carrier frequency (f5) for providing radio coverage to a respectively assigned mobile station (T14, T32) and the timeslot (TS5) is selected from the collectively assigned radio transmission resources taking account of an interference situation in the timeslot (TS5).

5. The method as claimed in one of the preceding claims, characterized in that with the second synchronization method both the base station and the mobile station adjust carrier frequencies and timeslot transmitting instants employed on a subscriber-specific basis.

6. The method as claimed in one of the preceding claims, characterized in that co-channel interference is minimized

at the base station and/or mobile station by means of interference suppression methods.

7. The method as claimed in one of the preceding claims, characterized in that radio transmission resources are assigned on the base station side in such a way that co-channel interference on adjacent radio cells is minimized.

8. The method as claimed in one of the preceding claims, characterized in that an OFDM radio transmission method is employed in the radio communication system.

9. The method as claimed in one of the preceding claims, characterized in that a TDD or FDD radio transmission method is employed in the radio communication system.

10. The method as claimed in one of the preceding claims, characterized in that with the second synchronization method a time deviation is determined by correlation and a frequency deviation is determined by ascertaining a phase rotation of consecutive symbols following a transformation into the frequency range.

11. The method as claimed in one of the preceding claims, characterized in that the second synchronization method is performed without additional signaling using a higher protocol layer between the base station and assigned mobile station.

12. The method as claimed in one of the preceding claims, characterized in that the synchronization method is selected by means of a time-dependent hysteresis function specified by a threshold value range.